

## Structural Behavior of Subsoil Depending on Constitutive Model in Calculation Model of Pavement Structure-Subsoil System

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**Abstract :** The load caused by the traffic movement should be transferred in the road constructions in a harmless way to the pavement as follows: – on the stiff upper layers of the structure (e.g. layers of asphalt: abrading and binding), and – through the layers of principal and secondary substructure, – on the subsoil, directly or through an improved subsoil layer. Reliable description of the interaction proceeding in a system “road construction - subsoil” should be in such case one of the basic requirements of the assessment of the size of internal forces of structure and its durability. Analyses of road constructions are based on: – elements of mechanics, which allows to create computational models, and – results of the experiments included in the criteria of fatigue life analyses. Above approach is a fundamental feature of commonly used mechanistic methods. They allow to use in the conducted evaluations of the fatigue life of structures arbitrarily complex numerical computational models. Considering the work of the system “road construction - subsoil”, it is commonly accepted that, as a result of repetitive loads on the subsoil under pavement, the growth of relatively small deformation in the initial phase is recognized, then this increase disappears, and the deformation takes the character completely reversible. The reliability of calculation model is combined with appropriate use (for a given type of analysis) of constitutive relationships. Phenomena occurring in the initial stage of the system “road construction - subsoil” is unfortunately difficult to interpret in the modeling process. The classic interpretation of the behavior of the material in the elastic-plastic model (e-p) is that elastic phase of the work (e) is undergoing to phase (e-p) by increasing the load (or growth of deformation in the damaging structure). The paper presents the essence of the calibration process of cooperating subsystem in the calculation model of the system “road construction - subsoil”, created for the mechanistic analysis. Calibration process was directed to show the impact of applied constitutive models on its deformation and stress response. The proper comparative base for assessing the reliability of created. This work was supported by the ongoing research project “Stabilization of weak soil by application of layer of foamed concrete used in contact with subsoil” (LIDER/022/537/L-4/NCBR/2013) financed by The National Centre for Research and Development within the LIDER Programme. M. Kadela is with the Department of Building Construction Elements and Building Structures on Mining Areas, Building Research Institute, Silesian Branch, Katowice, Poland (phone: +48 32 730 29 47; fax: +48 32 730 25 22; e-mail: m.kadela@itb.pl). models should be, however, the actual, monitored system “road construction - subsoil”. The paper presents too behavior of subsoil under cyclic load transmitted by pavement layers. The response of subsoil to cyclic load is recorded in situ by the observation system (sensors) installed on the testing ground prepared for this purpose, being a part of the test road near Katowice, in Poland. A different behavior of the homogeneous subsoil under pavement is observed for different seasons of the year, when pavement construction works as a flexible structure in summer, and as a rigid plate in winter. Albeit the observed character of subsoil response is the same regardless of the applied load and area values, this response can be divided into: - zone of indirect action of the applied load; this zone extends to the depth of 1,0 m under the pavement, - zone of a small strain, extending to about 2,0 m.

**Keywords :** road structure, constitutive model, calculation model, pavement, soil, FEA, response of soil, monitored system

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